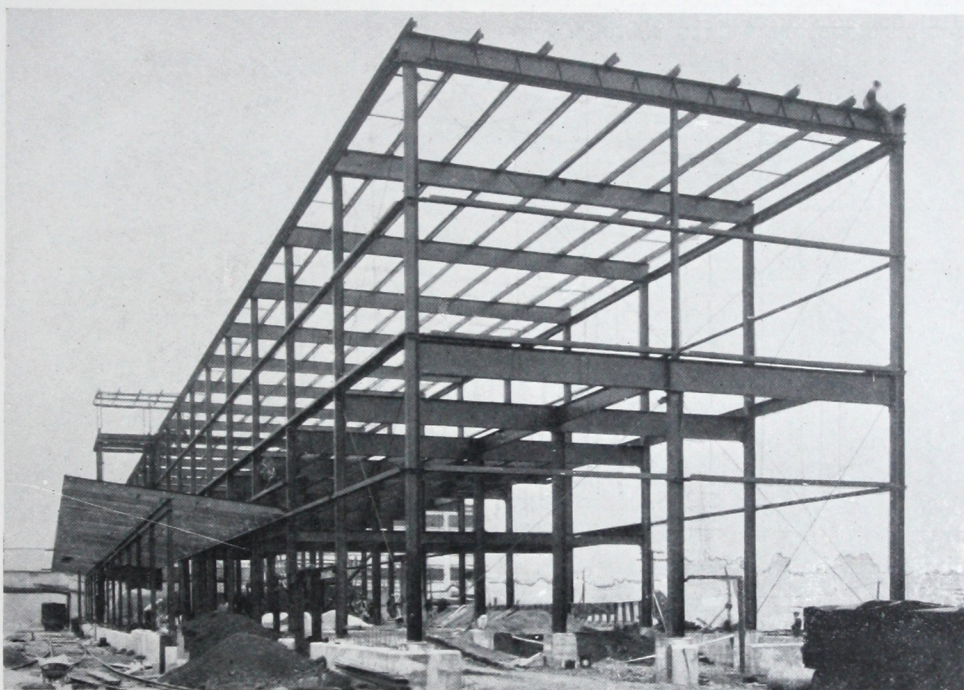


# Evidence That Welding Is Being Adopted for Fabricating Steel Bridges and Buildings\*

By

Frank P. McKibben, Consulting Engineer, Black Gap, Pa.



Arc-welded Frame of a Modern Factory Building

The last year has witnessed three interesting developments in the art of welding as applied to steel structures.

The most notable advance has been in the increased height and size of buildings in which arc welding has been used. As evidence of this, one need point only to such outstanding examples as the steam power plant of the Chalfont and Haddon Hall hotels in Atlantic City and the new Hotel Homestead, Hot Springs, Virginia, with heights of 150 feet and 180 feet respectively.

A second interesting development is the comparative ease with which existing steel bridges are strengthened by welding new steel to corroded or overstressed members, a process applied not only to highway structures but also to steam-railroad bridges. Indeed, welding could ask for no better indorsement than this adoption by some of the leading railroad systems of the world.

Of no less interest than these two phases of welding progress, is the changed attitude toward welding exhibited by many officials of municipal building departments, who are permitting welding and, at the same time, are modifying their building codes to authorize welding of steel building frames. Among the most interesting developments in this field is the publication of a uniform building code by the Pacific Coast Building Officials' Conference, Section 2710 of which covers welding (and its adoption by over 40 towns and cities) thus legalizing the construction of welded buildings. The Pennsylvania Legislature has passed an act permitting building departments of cities of the first class to adopt rules and regulations to cover welding, and the American Welding Society has also formulated a code applicable to welding of steel building frames.

\*This list of welded structures, which originally appeared in the July, 1928, issue of the *General Electric Review* is here presented in up-to-date form with many important additions.



## Bridges

(1). Single-track Pennsylvania R.R. Bridge over Susquehanna River at Havre de Grace, Md., double-decked by Maryland State Roads Commission for use as a highway bridge. Length of bridge 3000 ft. The entire upper deck and top bracing were arc welded. Steel added, 1500 tons.

(2). Single-track railroad bridge at East Pittsburgh Works of Westinghouse Electric & Manufacturing Co. Length of bridge, 62 ft., 4 in. Steel used, 50 tons.

(3). Through Warren trusses with sub-divided panels for single-track railroad bridge at Chicopee Falls, Mass. Welded structure weighs 80 tons. Span 135 ft.

(4). Bridge connecting two buildings, General Electric Company, Schenectady, N. Y. Built 1921. Span 35 ft.

(5). Welded columns used in bridge for carrying coal wagons.

(6). Welding steel reinforcing rods to existing steel arch bridge over Willamette River, Oregon City, Ore. Approximately 50,000 welds.

(7). Reinforcing Chicago Great Western R.R. Bridge over Missouri River, Leavenworth, Kans.; originally built 1893; consists of one 400-ft. draw span and two 330-ft. fixed spans. Electric welding by American Bridge Co. involved 225,000 lb. of structural steel, 7500 linear ft. of welding, and 2000 lb. of welding steel. Reinforcing done between February 28 and April 28, 1927, without interrupting trains.

(8). Princess Bridge, Melbourne, Australia; strengthened by welding.

(9). Combined electric railway and highway bridge over Lehigh Valley and Central of N. J. Railroads at Bound Brook, N. J., extensively strengthened and renewed by arc-welding in 1928, for Public Service Company. Two spans, each 85 feet. Steel added, 50 tons.

(10). Harahan Bridge over Mississippi River at Memphis, Tenn. Two hundred and fifty tons of steel arc welded in widening the roadway, 1928-1929.

(11). Pennsylvania Railroad Bridge, Conemaugh Division, over Kiskiminetas River, three-span, pin-connected truss bridge had four diagonal eye bars of trusses tightened by arc welding turnbuckle inserts to each loose bar and then removing a portion of the eyebar to throw stress on the welded insert, thus equalizing the stresses in the eyebars. Welding done by Pittsburgh Welding Corporation.

(12). Highway bridge, pin-connected 240-foot span over Allegheny River connecting Herrs Island with the North Shore, Pittsburgh, Pa., strengthened in 1925 by removing corroded metal from truss verticals and replacing with new material arc welded by Pittsburgh Welding Corporation.

(13). A foot bridge or trestle, containing 105 tons of steel, 846 feet long, 20 spans, leading from General Electric Company's Schenectady, N. Y., plant, spanning Delaware and Hudson Railroad tracks, and extending to a nearby hillside. Arc welded 1928.

(14). Smithfield Street Bridge over Monongahela River, Pittsburgh, Pa. Lower chord eyebars, floor beam suspender plates reinforced and top chord struts added by arc welding, 1929.



Railroad Bridge in Process of Repair by Arc Welding

## Buildings

(15). Shop Building No. 1, West Philadelphia plant of General Electric Company, approximately 1000 tons of beams, columns, and trusses. Electrically welded, 1927-1928. Shop 136½ ft. wide, by 551 ft. long, with a wing. Trusses 58½-ft., 77-ft., and 78-ft. spans, has bridge cranes and wall cranes. Fabricated, erected, and welded by American Bridge Co.

(16). Shop Building, 42 ft. long, 66 ft. wide, connecting existing Buildings 44 and 45 at Bridgeport, Conn., plant of General Electric Company. Has four trusses of 64-ft. span supported on steel columns. Fabricated by American Bridge Co. Erected by Leak and Nelson Co., Bridgeport, Conn. Built 1928.

(17). Shop Building No. 38 at Pittsfield, Mass., plant of General Electric Company. Width 60 ft., length 270 ft. Three stories in part; one and two stories elsewhere. Fabricated and erected 1928 by American Bridge Co.

(18). Five-story building at Sharon, Pa., for Westinghouse Electric & Manufacturing Co. Built

10 90-B 1925 TLF



1926 by American Bridge Co. Live load, 300 lb. per sq. ft.; 790 tons of steel; 70 ft. wide, 220 ft. long, 80 ft. high.

(19). Two-story boiler shop at Schueter Boiler Works, Janesville, Wis. Building 66 ft. wide by 86 ft. long. No bolts or rivets used.

(20). New hotel building, 180 ft. high; 60 ft. by 72 ft.; built 1928 by American Bridge Co. for Hotel Homestead, Hot Springs, Va. Eleven full stories in tower portion with smaller floors within sloping roof and cupola. Tower flanked either side by six-story wings, 40 ft. by 47 ft., 560 tons of steel, arc welded in shop and field.

150 ft. wide by 220 ft. long, 150 ft. high; supports for book stacks arc welded. Built 1928.

(25). Four stories added in 1928 to existing six-story Rose Building, Cleveland, Ohio, and old columns strengthened by arc welding. Forest City Structural Steel Co., Cleveland, fabricated, erected, and welded the building.

(26). Three large steel hangars for Houston, Tex., municipal airport. Each hangar's arch steel frame is 75 ft. wide, 125 ft. long, and approximately 50 ft. high. All steel was arc welded in 1928. No bolts or rivets used.



Another Arc-welded Factory Building

(21). One-story automotive shop of Associated Oil Co., at Emeryville, Calif. Steel tonnage 110. Several aisles with roof trusses of 60-ft. spans. Building covers 60,000 sq. ft. No rivets or bolts used in the structure. Arc welded by Brown Bros., San Francisco.

(22). Six-story steam power house of Chalfont and Haddon Hall hotels, Atlantic City, N. J., built 1928 by Bethlehem Steel Co. Building 72 ft. wide, 79 ft. long, 150 ft. high. Steel tonnage, 541. All shop work on columns welded. All field connections of beams and girders at or within three feet of columns electrically welded, as were all column splices, and connections of new steel beams to steel columns in an adjoining building. Filling-in beams bolted.

(23). Three-story bank and office building, 65 ft. wide by 140 ft. long, built 1928 by Fort Pitt Bridge Co. for Tonawanda Power Co. at North Tonawanda, N. Y. Arc welded; steel tonnage, 200.

(24). Yale University library, New Haven, Conn.,

(27). Six-story new addition to Ohio Valley General Hospital, Wheeling, W. Va.; erected by R. R. Kitchen Co., 1928; all field connections arc welded; shopwork riveted. Steel tonnage, 150.

(28). Office and theatre building in Portland, Me., has arc-welded steel struts; built 1928, by Lehigh Structural Steel Co. of Allentown, Pa.

(29). Several one-story garages and other buildings, up to 117-ft. spans, arc welded by Arch Engineering and Construction Co. of Orlando, Fla. Includes packing plant, 80 ft. by 225 ft., arc welded for Seaboard Airline Ry. Co. at Winter Garden, Fla.; also a packing house 117 ft. by 202 ft.

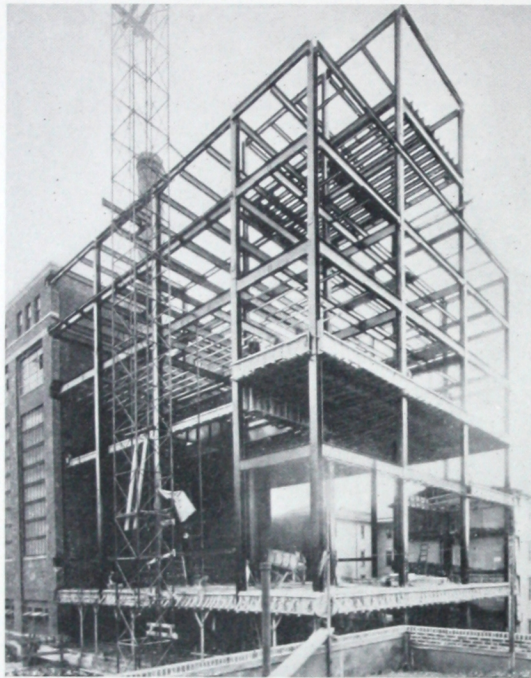
(30). Five-story county office building and court house at Norristown, Montgomery County, Pa. 800 tons of steel arc welded, 1929, in field by Mellon, Taylor, and Hendrickson of Philadelphia. Building 58 ft. by 201 ft. Height 94 ft.

(31). State Armory, Kingston, Pa., had some braces inserted by arc welding in 1928.



(32). Heavy shop building, Number 49, General Electric Company, Schenectady, N. Y., had existing riveted crane runways strengthened and reinforced by welding plate stiffeners to runway plate girder webs, by welding flange angles to webs, cover plates to flange angles, and by welding additional flange plates.

(33). Rolling-mill building at East Pittsburgh plant of Westinghouse Electric & Manufacturing Co.;



Arc-welded Power House for Chalfonte and Haddon-Hall Hotels; Atlantic City, N. J.

80 ft. by 120 ft. Roof trusses made entirely of "T" shapes. Steel tonnage, 65.

(34). Molded Material Plant building at North Trafford City, Pa., works of Westinghouse Electric & Manufacturing Co. Building 100,000 sq. ft. of floor area, "U" shape; comprising units 440 ft. long by 62 ft. wide, another unit 133 ft. long by 60 ft. wide, and a third unit 460 ft. long by 102 ft. wide. One and three stories in height.

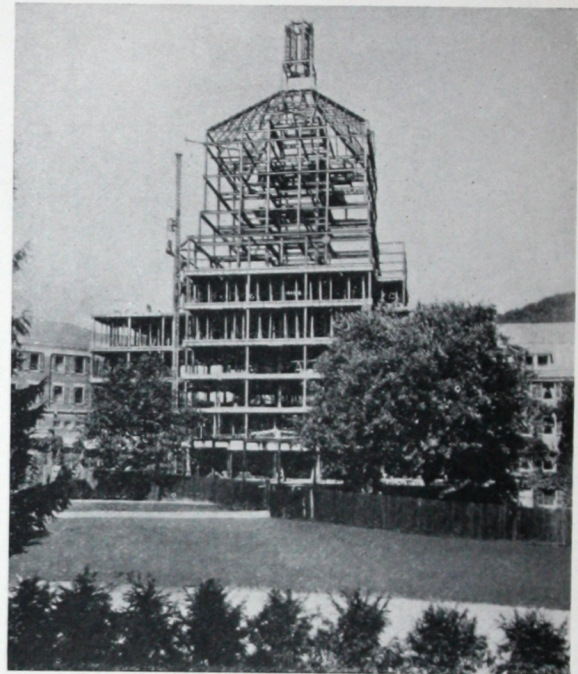
(35). Eight-story existing Bamberger Building, Newark, N. J., increased in height and existing columns strengthened by arc welding in 1929.

(36). One-story warehouse, 100 ft. wide, 220 ft. long, with a 10-ft. lean-to on one side, arc welded in 1928 for Capitol Rice Mills, Sacramento, Calif. Building has two main aisles on steel columns supporting roof trusses with 50-ft. spans.

(37). Four-story Upper Carnegie Office Building, Cleveland, Ohio, 60 ft. wide, 119 ft. long, built 1928, by the Austin Company, General Contractors, for Owners Investment Co. Arc welded. Steel tonnage, No rivets or bolts used in the steel frame.

(38). Thirteen roof trusses of 50-ft. span; arc welded, 1929, Hecla Mining Co., Wallace, Idaho.

(39). Six-story building of brick and concrete, built 1927-1928 by Columbian Steel Tank Company for their own use in Kansas City, Mo., has a roof of welded tubular construction. Roof is 93 ft. by 120 ft., supported on modified bowstring welded trusses with spans of 42 ft. from center column to each side wall.



Homestead Hotel, Hot Springs, Va., Arc Welded and Erected by American Bridge Co.

(40). Thames River Steam Power Plant of Eastern Connecticut Power Co., Montville, Conn., provided in 1929 with additional steel wind bracing arc welded by United Engineers and Constructors. Building 60 ft. wide by 147 ft. long.

(41). One-story factory building arc welded, 1928, by Maine Steel Products Co., South Portland, Me.; erection and welding supervised by Manchester Engineering Co., Manchester, N. H. Building 60 ft. by 200 ft. with connecting ell 25 ft. by 80 ft. Main building has one aisle 44 ft. wide with five-ton crane, and one side aisle 16 ft. wide with two-ton traveling hoist. Roof trusses and all other steel arc welded. No rivets or bolts used.

(42). One-story shop, 53 ft. wide by 72 ft. long, erected 1928 in Providence, R. I., by Providence Steel and Iron Co. for its own use. Roof trusses, 53-ft. span.

(43). Main factory building of the Lincoln Electric Co., Cleveland, O. Consists of three stories and a basement, and has vertical members welded; constructed in 1926. Building is 50 ft. by 130 ft.



(44). Mill Building. Roof trusses; three 19-ft. spans. Brixton, England. Area of building, 20,000 sq. ft.

(45). Mill Building at Tottenham, London. Built for Galvanizing Equipment Co. by Welded Construction Co. Main truss span, 40 ft. with two 15-ft. side spans.

(46). Mill building. One story, built by C. B. & Q. R.R. at Eola, Ill.

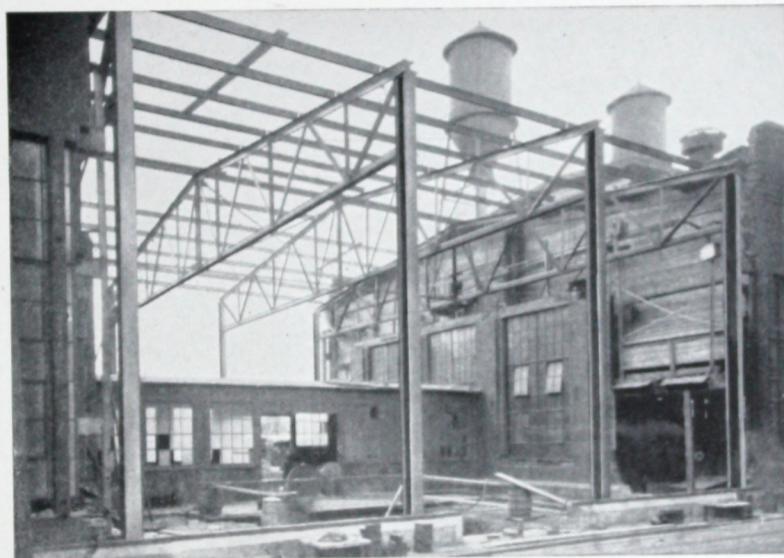
(47). Warehouse for materials of Chicago District Plant of Mississippi Valley Structural Steel Co. at Melrose Park, Ill. Trusses, columns, and crane

by Berkeley Construction Co. Dimensions, 50 ft. by 250 ft. Has two 10-ton cranes. Arc welded.

(55) One-story building. Built at Sharon, Pa., for Westinghouse Electric & Manufacturing Co. in 1926. Building 40 ft. by 102 ft.; 27 tons of steel. Crane runway for one-ton crane.

(56) One-story building at East Pittsburgh Works of the Westinghouse Electric & Manufacturing Co. Built 1926 and 1927; 40 ft. by 100 ft.

(57) One-story garage at East Pittsburgh, Pa., by Westinghouse Electric & Manufacturing Co. in 1926; 60 ft. by 90 ft.



Arc-welded Trusses for a New Factory Building

columns are all welded. Crane, 20-ton capacity, span 84 ft. Dimensions of building, 135 ft. by 340 ft.

(48). Material shed building. Built 1920 by Electric Welding Co. of America in Brooklyn. Roof trusses, 40-ft. span; tested by Department of Buildings, City of New York. Has traveling crane.

(49). One-story building, Derry, Pa.; built 1927 for Westinghouse Electric & Manufacturing Co. by Jones and Laughlin Steel Corp. Dimensions of building 150 ft. by 460 ft. with a wing; 336 tons of steel.

(50). Building at Youngstown, O., built 1926 by Youngstown Welding Co. Dimensions 70 ft. by 220 ft.; carries traveling crane. All field erection welded; no bolts or rivets used.

(51). Building at St. Louis, Mo., plant of Mississippi Valley Structural Steel Company. Dimensions 30 ft. by 50 ft. All shop work welded; field work bolted.

(52) Garage building, Canton O., for Peerless Auto Sales Co. Two stories and basement. Building is 100 ft. by 150 ft.

(53) One-story garage at Dallas, Tex., built by Dallas Power and Light Co. Two units, each 16 ft. by 140 ft.

(54) One-story building at Berkeley, Calif. Built

(58) One-story steel frame building Newport News Shipbuilding and Dry Dock Co., Newport News, Va. Building 63 ft. by 53 ft.; carries completely welded ten-ton fish-belly crane.

(59) One-story building constructed in Detroit for Barnes Wire Fence Co. This structure was entirely field welded; no bolts or rivets were used.

(60) Two one-story buildings at Waukegan, Ill. Built by General Boilers Co.; one 25 ft. by 85 ft.; the other 25 ft. by 50 ft.

(61) Steel frame of 25-story addition welded to original steel building of First National Bank Building in Detroit, Mich., 1927.

(62) Fifteen-story steel frame addition to J. L. Hudson Co. Department Store, Detroit, Mich.; has steel frame of 12 lower stories welded to existing building of same owner.

(63) Steel frame of twelve-story addition welded to original steel building of People's Outfitting Co., Detroit, Mich.

(64) Steel frame of four-story addition welded to original steel building of Detroit Trust Company.



(65) Welding employed in some connections for addition to Michigan Bell Telephone Building in Detroit.

(66) Addition to chemical laboratory at Westinghouse Co., at East Pittsburgh, Pa.

(67) Two additions, each a one-story building, welded to original building of Chevrolet Motor Car Co., at Janesville, Wis.

(68) Foundry building extension, 100 ft. by 54 ft. Main roof truss span, 35 ft. Built 1920 at Stoke-on-Trent, England, by Welded Construction Co. Carries traveling crane of 50-ft. span.

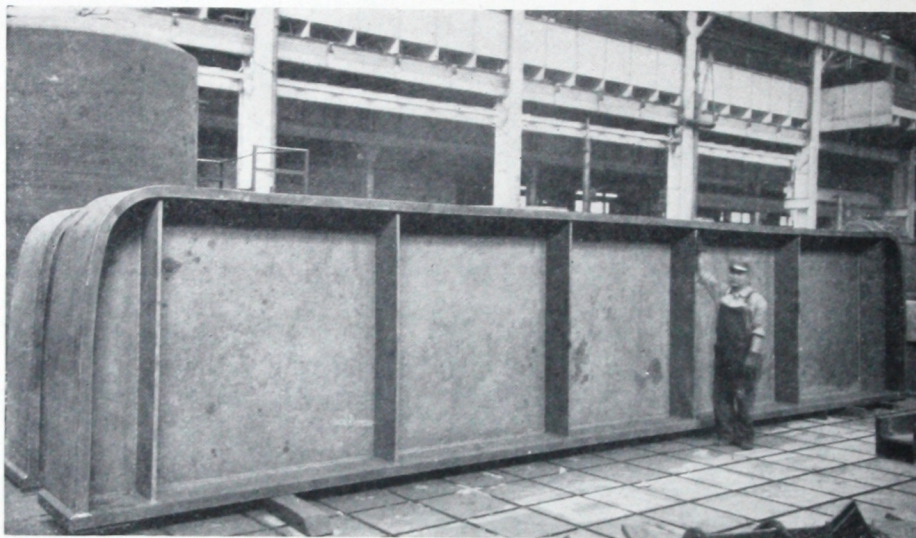
(75) Roof trusses over West Yard at St. Louis, Mo., plant of Mississippi Valley Structural Steel Co. Span 78 ft.

(76) Roof trusses, oxyacetylene welded at Cincinnati Prest-o-Lite plant in 1926. Spans 27 to 48 ft.

(77) Roof trusses. Tested at Buffalo by Union Carbide and Carbon Co. in 1926. Span, 40 ft.

(78) Welded trusses in building for Modern Pouring Device Co. at Port Washington, Wis.

(79) Roof truss. Stables at Horse Show, Olympia, England. Built 1920. Span, 14 ft.; area of building, 9000 sq. ft.



Girders Fabricated by Arc Welding

(69) Two retort houses are welded by Metropolitan Gas Company at Melbourne, Australia; no rivets used; each house 34 ft. wide by 125 ft. long, 82 ft. 3 in. to the eaves; steel tonnage of each house 375. In addition, there are two arc-welded steel chimneys 100 ft. high and 5 ft. in diameter. Also a 2000-ton storage hopper and four long-belt conveyors all arc welded. Three previously built retort houses extensively reconstructed and strengthened by arc welding.

(70) Kiln and coolers at Saulte Sainte Marie Plant of Union Carbide Co. welded by Reeves Bros. Co., Alliance, O. Kiln, 8 ft. by 125 ft.; three coolers, 5 ft. by 55 ft.

(71) Concentration plant for Ammonical Liquor, Australia.

(72) Additional floor welded in between original roof and original top floor of Crowley, Miller, and Co. Department Store, Detroit, Mich.

(73) Steel floor at Hershey Chocolate Co., 24 ft. by 64 ft.

(74) Roof trusses over West Yard at Decatur, Ill. Plant of Mississippi Valley Structural Steel Co. Span 84 ft.; both shop work and field splices welded.

#### Cars

(80) Locomotive tender. Built for Boston & Albany R. R. at West Springfield, Mass.

(81) Gondola freight car. Built for C. B. & Q. R. R. by American Car and Foundry Co. in 1921. Capacity 50 tons.

(82) Annealing car, General Electric Company, Schenectady, N. Y. Built 1921.

(83) Transformer car electrically welded by Mosher Steel and Machinery Co., Dallas, Tex.

#### Cranes

(84) Large boom for derrick. Built 1922; 90 ft. long.

(85) Ten-ton fish-belly crane in foundry, Newport News Shipbuilding and Dry Dock Co., Newport News, Va. Built January 1927. Span 50 ft., 5½ in.

(86) Crane runway, Coplay Cement Mfg. Co., carries crane and 10-ton bucket. Seven plate-girder spans and steel "A" frames.

(87) Brackets for crane runway, General Electric Company, Schenectady, N. Y.

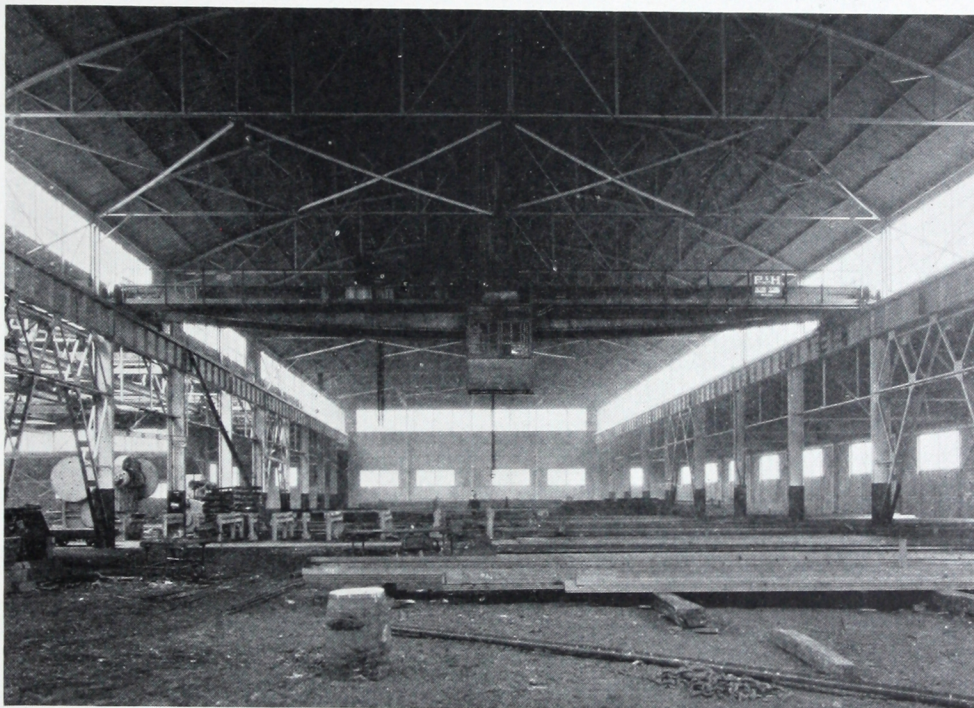
(88) Eighteen hundred linear feet of steel crane runway girders arc welded for Interboro Rapid Transit Co., New York, N. Y. Steel tonnage, 150.



(89) Pittsburgh and Lake Erie Railroad crane runways in freight yards near Pittsburgh, Pa. Strength increased from  $7\frac{1}{2}$  tons to 40 tons capacity by arc welding. No rivets or bolts used. Top and bottom flanges of runway girders strengthened by welding additional plates. Welding done by Pittsburgh Welding Corporation.

### Frames and Towers

(90) Steel frame for large electric sign, Radio Station WGY, General Electric Company, Schenectady, N. Y.



Crane Runway, 80-ft. Span, and Crane Columns, Arch Trusses, and Purlins, All Arc Welded

(91) Steel frame for boxing arena lights at Philadelphia Sesquicentennial Exposition.

(92) Transmission line, tower, Belgium; 72 ft. high.

(93) Transformer tower built by General Electric Company, Schenectady, N. Y. Built 1920. Carries traveling crane. Dimensions, 40 ft. by 40 ft. by 40 ft.; 34,339 lb. of steel.

(94) Radio tower at Peking, China, 115 ft. high.

(95) Tower in Cave, Calif.

(96) Four completely arc-welded pile drivers each 75 ft. high. Fabricated and welded by Mississippi Valley Structural Steel Company of Melrose Park, Ill., for the Walsh and Masterson Company, Chicago, Ill.

### Ships, etc.

(97) S. S. *California* launched October 1, 1927, largest merchant ship constructed in United States to that date; over-all length 601 ft. 3 in., breadth 80 ft.,

depth 52 ft. Twin-screw passenger and freight ship built by Newport News Shipbuilding and Dry Dock Co. Principal welding was in partition bulkheads. Thirty thousand pounds of welding electrodes used.

(98) S. S. *Virginia*, launched August 18, 1928, largest merchant ship constructed in United States; over-all length 613 ft. Arc welding used very extensively. Forty-three thousand pounds of welding electrodes employed.

(99) Yacht, *Viking*, 272 ft., built 1928-1929 by Newport News Shipbuilding and Dry Dock Co. for Mr. George F. Baker, Jr. Welding extensively used.

(100) U. S. Coast Guard Cutter *Northland*, built in 1927 at Newport News Shipbuilding and Dry Dock Co.; rudder metallic arc welded, and metallic arc welding used extensively on decks, bulkheads, etc. This vessel, length over-all 216 ft., breadth 29 ft., and depth 52 ft., was built for service in Arctic ice floes. Rudder steel-plating,  $\frac{5}{8}$ -in. thick, welded to cast-steel frame. Thirteen thousand pounds of electrode material used in this ship.

(101) Ship *Fulagar*, built in 1920 by Cammel, Laird & Co., at Birkenhead, England. Length, 150 ft.

(102) Motorboat *Sea Hornet*, built in 1920 by Kyle & Purdy, City Island, New York, N. Y. Length 58 ft.

(103) Tugboat, built in 1920 by Electric Welding Co., Gothenburg, Sweden. Length, 52 ft., 6 in.

(104) Tugboat, built in 1915 by Geary Boiler Works, Ashtabula, O. Length, 42 ft.

(105) 1200-ton Oil Barge, *Hisco*. Built 1917 by Tank Shipbuilding Co., Newburgh, N. Y.



(106) English Channel Barge, AC-1320. Built 1917. Length 125 ft., 9 in.

(107) Oil Barge *Independent*. Built 1924 by Saxe Providence Boiler Works, Providence, R. I. Length 76 ft.

(108) Steel floating caisson for dry dock, Hikoshuma Drydock, Japan.

(109) Pontoon for 120-ton derrick with shell, deck, and two bulkheads welded. Built in 1925 at Norfolk Navy Yard.

assembly holes used. Constructed by S. O. S. Welding Corporation, South Brooklyn, N. Y.

#### Tanks

(114) Oil-storage tanks of 40 and 150 ft. diameter, respectively. Built 1920 for Oklahoma Producing and Refining Corporation by Electric Welding Co. of America.

(115) Two 1000-barrel oil-storage tanks at Uniontown, Pa.; oxyacetylene welded in 1924 by Linde Air Products Co.



Tower for Pile-Driver, 75 ft. High, Fabricated by Arc Welding

(110) Pontoon for crane at Kobe, Japan; length 65 ft.

(111) Seventeen 45-ton, 172-ft. U. S. Navy battle towing targets built at Norfolk Navy Yard and Puget Sound Navy Yard between 1918 and 1927. Supersede 50-ton riveted targets previously used.

(112) Two scows, channel-type, 116 ft. long, 34 ft. wide, 10 ft. 3 in. deep, each with carrying capacity of 850 net tons of cargo. Twelve-inch channels used, the heel and toe being welded. Built by Federal Shipbuilding and Drydock Co., Kearny, N. J.

(113) Barge *Supertest* ex *Pioneer*, a gasoline tanker, 100 ft. long. Lap and "T" joints used entirely. No

(116) Tank used as creosoting still; oxyacetylene welded at works of Reeves Bros. Co., Alliance, O. This tank, which is 90 in. in diameter by 90 ft. long and built of 1-in. steel plates, operates at 200-lb. steam pressure and 24-in. vacuum; tested to three times normal steam pressure.

(117) Steel swimming pool, Standard Club, Chicago, Ill. Pool is 60 ft. long and 300 ft. wide.

(118) Steel swimming pool built 1924 by Norfolk Navy Yard for the Officers' Club. Capacity of tank, 100,000 gal.

(119) Gas holder for Metropolitan Gas Co.,



Melbourne, Australia; 600 tons of steel; 3,000,000 cu. ft. capacity.

(120) Purifiers for Metropolitan Gas Co., Melbourne, Australia; 150 tons of steel; 3,000,000 cu. ft. capacity.

(121) Gas holder at Columbia, O., oxyacetylene welded by Linde Air Products Co. in 1924; diameter, 50 ft.

(122) Gas holders at Albion, Mich., built 1928 by Western Gas Construction Co. of Fort Wayne, Ind. Diameter, 74 ft.; max. height, 113 ft., 7 in. Structure embodied 258 tons of steel, arc welded; four tons of welding wire used in 21,414 linear ft. of welding.

(123) New steel roof on gas holder at Fitzroy, Australia. Built by Metropolitan Gas Co.

(124) Gas holder at Salt Lake City, Utah, oxyacetylene welded by Linde Air Products Co. in 1924; diameter, 50 ft.

(125) Gas holder of 15,000 cubic feet capacity built at Lexington, Mo., by Western Gas Construction Co. Arc welded in 1925.

#### Tests

(126) General Electric Company shear, tensile, and compressive tests, 1927 and 1928.

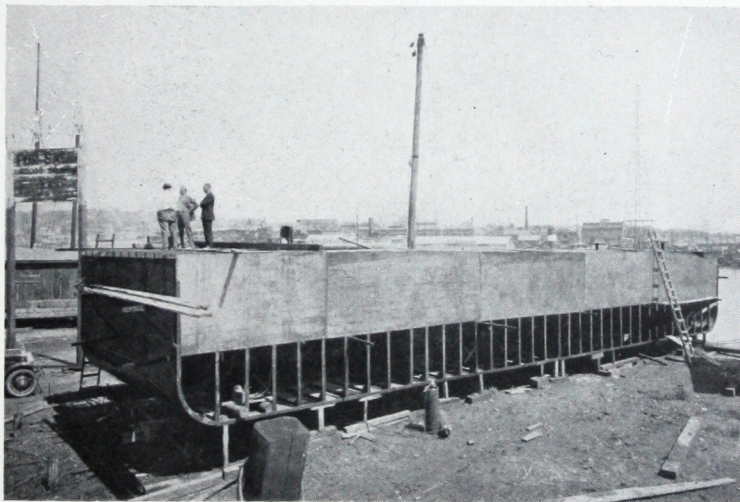
(127) Westinghouse Electric & Manufacturing Co. Tests made at Carnegie Institute of Technology.

(128) American Bridge Co. Tensile specimens, girders, and columns were tested at Bureau of Standards.

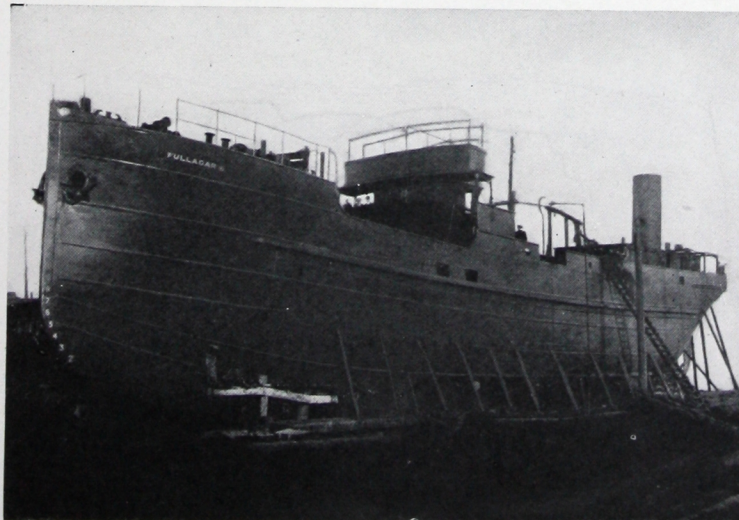
(129) Metropolitan Gas Co., Australia. Tests on welded tubular columns in connection with 6-ton, 50-ft. jib for derrick crane.

(130) Metropolitan Gas Co., Melbourne, Australia. Tensile tests, etc. at Melbourne University.

(131) Morgan Engineering Co. Shear tests.



Arc-welded Tanker, 76 ft. Long by 21 ft. Wide by 11 ft. Deep



Arc-welded Coaster Built at Birkenhead, England



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|---|--|
| (132) Ernest Humphreys, Jr. Shear tests, 1921.  | (136) Coplay Cement Co. Shock tests.   |
| (133) Westinghouse Electric & Manufacturing Co.<br>Vibration and impact tests.        | (137) University of Illinois. Various tests.   |
| (134) Mississippi Valley Structural Steel Co.<br>Tests of garage roof of 49-ft. span. | (138) Lloyd's Bureau of Shipping.  |
| (135) Bureau of Buildings, New York City.<br>Roof trusses tested at Brooklyn, N. Y.   | (139) Union Carbide tests.   |
|   | (140) American Bridge Co. Roof trusses, 58 ft.,<br>6-in. span, tested at Trenton Plant, December, 1927,<br>for General Electric Company. |



Arc-welded Gas Holder of 15,000 Cu. ft. Capacity



# Appendix

## Cities Which Have Adopted the Uniform Building Code

of the

## Pacific Coast Building Officials' Conference Which Includes Arc Welding

As of June 25, 1929

Prescott.....	Arizona
Tucson.....	Arizona
Yuma.....	Arizona
Eldorado.....	Arkansas
Alhambra.....	California
Alameda.....	California
Alturas.....	California
Berkeley.....	California
Claremont.....	California
Compton.....	California
Corcoran.....	California
Coronado.....	California
El Monte.....	California
Fontana.....	California
Fresno.....	California
Fullerton.....	California
Laguna Beach.....	California
Livermore.....	California
Madera.....	California
Martinez.....	California
Monterey Park.....	California
National City.....	California
Oceanside.....	California
Ontario.....	California
Oxnard.....	California
Pasadena.....	California
Piedmont.....	California
Pittsburg.....	California
Pomona.....	California
Redlands.....	California
Sacramento.....	California
San Anselmo.....	California
San Bernardino.....	California
San Fernando.....	California
San Jose.....	California
San Leandro.....	California
San Rafael.....	California
Santa Monica.....	California
South San Francisco.....	California
Tujunga.....	California
Tulare.....	California
Upland.....	California
Visalia.....	California

Walnut Creek.....	California
Watsonville.....	California
Shreveport.....	Louisiana
Meridian.....	Mississippi
Grand Forks.....	North Dakota
Eugene.....	Oregon
Klamath Falls.....	Oregon
Salem.....	Oregon
Ellensburg.....	Washington
Kelso.....	Washington

The following is a list of the cities in which it would appear that under reasonable supervision, welding is an acceptable tool by reason of the fact that welding has been used in them:

Emeryville, Calif.  
South Sacramento, Calif.  
Bridgeport, Conn.  
New Haven, Conn.  
South Portland, Maine  
Pittsfield, Mass.  
Detroit, Mich.  
Atlantic City, N. J.  
Cleveland, Ohio  
Youngstown, Ohio  
Sharon, Pa.  
Providence, Rhode Island  
Wheeling, W. Va.

and many others as indicated in the list of the places where welded structures have been erected.

The following are among the principal cities which at present are revising their codes and have welding under consideration:

Birmingham, Ala.  
Chicago, Ill.  
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